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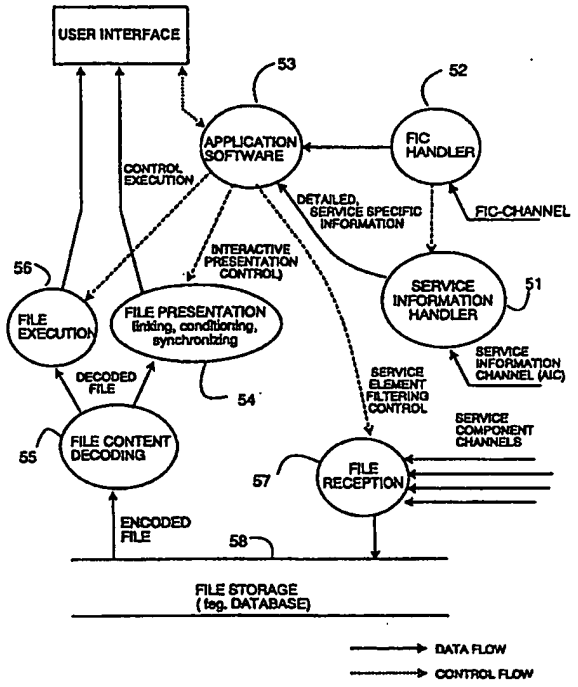
(54) Title: A METHOD AND AN EQUIPMENT FOR TRANSMITTING A FILE-BASED MULTIMEDIA AND HYPERMEDIA SERVICE TO A MOBILE RECEIVER

(57) Abstract

In the transmission of multimedia and hypermedia services to a mobile receiver no mechanisms have yet been specified in new radio systems, such as the DAB system for transmitting service components and files so that the software of the receiver would be able to receive, combine, form, present and execute the services in the way desired by the user. In accordance with the invention, the service is divided into files at the transmission end. Each file is associated with a group of parameters called a message type. The message types are: file transfer description, file content description, file presentation description and file execution description. By filtering the files utilizing their message types, the receiver can separate selectively from the service channel only the required files or service elements.



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A method and an equipment for transmitting a file-based multimedia and hypermedia service to a mobile receiver

The present invention relates to data transmission utilizing such a digital transmission channel that enables the transmission of audio and data services and the selective reception of these services. The information transmitted on the transmission channel can either be in a continuous data stream or packet form.

In the digital audio system DAB (Digital Audio Broadcasting) developed for using frequency bands efficiently the transmission path is completely digital and the system is intended to replace the present generally used analog broadcast system using frequency modulation. The DAB is especially designed for a mobile environment, that is, the receiver can be mobile so that different attenuations and disturbances produced by the propagation of a radio signal can be prevented by the combined effect of suitable modulation and channel coding. A DAB receiver is capable of enduring several echoes originating from the same source and thus a country-wide radio coverage can be achieved with one frequency channel since the signal of the other stations than the one to be listened to is interpreted as an echo and will be eliminated.

The DAB determines the digital radio channel based on many carriers that is suitable for the transmission of both audio and data services. A completely digital transmission channel may be either a continuous data stream or packet channel. Packet switching is more flexible and enables more easily the transmission of data units of a finite length. The transmission, transfer and reception of the DAB system is explained in detail in Kimmo Hakkarainen, MSc

Thesis, A Channel Encoder/Decoder for DAB Demonstrator, 1995, Tampere University of Technology, pages 2 to 13. For the receiver the highest abstraction level of the DAB system is called an ensemble. One ensemble is divided into several services and each service is further divided into service components. A service component is either an audio channel or a data channel.

Figure 1 discloses one DAB system in a simplified way. At the transmission end a control device 1 controls the transmission. A FIC and control block 2 produces SI (Service Information) information relating to audio and data services, Multiplex Configuration Information MCI and CA (Conditional Access) information relating to conditional access that can be information relating to chargeability/encryption of the services. Taken together, they form a fast information channel FIC. Audio information, such as music, supplied by producers 3 of audio services is compressed in a MPEG encoder 4 and is led to audio channel encoders 5. Similarly, the data supplied by producers 6 of data services is encoded in data channel encoders 7. The channel encoded data, audio and FIC information are led to a block carrying out orthogonal frequency division multiplexing OFDM. The OFDM symbol produced by an inverse fast Fourier transformation of the block is a group of subcarriers with an exactly determined duration. Individual subcarriers are modulated by a D-QPSK (Differential Quaternary Phase Shift Keying) method and at the end it results in a DAB transmission signal that comprises successive transmission frames. Each frame is time multiplexed between a synchronization channel, a fast information channel FIC and a channel MSC (Main Service Channel) containing audio and data services. Transmission mode I intended for radio network on the ground using one

frequency has 1,536 carriers, a frame has 76 symbols and the duration of a frame is 4* 24 ms=96 ms. Transfers can be made in the frame. Mode II intended for ground-level and satellite transmissions has 384 carriers, a frame has 76 symbols and the duration of a frame is 24 ms. 55,296 MSC bits and 1,024 FIC bits are transferred in a frame. Mode III intended for ground-level, satellite and cable transmissions has 192 carriers, a frame has 153 symbols and the duration of a frame is 24 ms. 55,296 MSC bits and 1,024 FIC bits are transferred in a frame.

The signal received at the transmission end is decoded in a COFDM (Coded Orthogonal Frequency Division Multiplex) block 9 that converts an I-Q signal into a digital mode, the digitalized signal is transferred to the frequency level by a fast Fourier transformation, frequency interlacing is removed and the transmission frames are comprised of successive OFDM symbols. The information channel FIC and the channel MSC containing audio and data services are separated from one another and the subchannels are separated from the MSC channel and they are channel decoded in decoders 5' and 6'. The desired subchannels are then conducted to be processed further. The subscriber finds out from the received FIC channel what services the received signal contains and can accordingly select the desired service or services.

One advantage of the DAB system is that data capacity can be reserved dynamically for service providers. For a moment, the capacity can be at most 1,728 Mbit/s. Then data is transmitted in packets, as shown in Figure 2A, that contain a header field, a data field and a check sum. The meanings of the described fields are in compliance with the DAB standard. The packet header contains information on the length of the packet (PKT LEN) that can be 24, 48, 72 and 96 bytes,

a continuity index (CONT IND), the first/last packet information (FIRST/LAST), the address (PKT ADDRESS) identifying the service component, the command, the actual length of the data field (DATA LEN). The data field contains the actual data to be transmitted and stuffing bits when needed. At the end there is a check sum of the packet (PKT CRC).

The data fields of the packets form a so-called Data Group, Figure 2B. Generally a data group comprises several data fields of packets to be transmitted in sequence. At its simplest one packet is sufficient for forming one data group.

A data group is comprised as shown in Figure 3.

The fields of the group header are the following:

EXL FL	Extension flag
CRC FL	CRC flag
SES FL	Session flags
DG TYPE	Data group type
CONT IND	Continuity index
REP IND	Repetition index
EXT FIELD	Extension field

The fields of the session header are the following:

LAST FL	Last
SEG NUM	Segment number
RFA	Reserved
LEN IND	indicates the length of the next address field
ADDR.FIELD	End user's address (LEN IND)

These header fields are followed by the actual data and the check sum of the data group.

At least in theory, the DAB system enables the transmission of multimedia and hypermedia type of services to a mobile user. However, a problem is that in the transmission of multimedia and hypermedia

services to a mobile receiver no mechanisms have yet been specified for transmitting service components and files so that the software of the receiver would be able to receive, combine, form, present and execute the services in the way desired by the user in accordance with the possibilities produced by the service provider.

The object of this invention is to achieve a method and an equipment which will obviate the problem mentioned above.

The object is reached with the method according to claim 1 and an equipment according to claims 9 and 10.

In accordance with the invention, the service is divided into files at the transmission end. A service ensemble is formed by the mutual parallel and successive presentation of the files in time and spatial domain. A parameter group called a message type is associated with each file. There are four message types:

1) file transfer description,
2) file content description,
3) file presentation description, and
4) file execution description.

At the reception end the user can form by filtering a profile of his/her own for the service. A message type associated with each file is utilized in filtering. The profile is as such a definition description that can be represented by a flow chart, a matrix, a navigation path or a tree. By means of it the receiver is able to receive selectively only the required files or service elements from the service channel. By means of the profile the reception program can present the service formed by the files correctly to the user. As the message types are parameterized, as much interactivity

as is desired can be included in the forming stage of the service profile. This interactivity is, however, local between the user and the service channel and not direct between the user and the service provider.

A service profile is formed by searching for elements, classes and objects from the reception channel, by identifying their groups and by searching for the attributes and connections of the groups.

The invention is also characterized in that the service components are timed by applying a time stamp "start", "end" and "duration" to the component. The application is carried out by comparing the time stamp with a reference time scale. A presentation of the components can be in a parallel or series form.

The invention will in the following be explained in more detail by means of one preferred embodiment of the invention with reference to the appended diagrammatic figures and tables, in which

Figure 1 shows one DAB system,

Figures 2A and 2B illustrate the connection between a data group and data packets,

Figure 3 shows the structure of a data group,

Figure 4 illustrates a receiver suitable for media applications,

Figure 5 illustrates the operational arrangement according to the invention in a receiver,

Table 1 shows the parameters of a file transfer description,

Table 2 shows the parameters of a file content description,

Table 3 shows the parameters of a file presentation description, and

Table 4 shows the parameters of a file execution description.

Figure 4 shows one receiver suitable for media applications. A received ensemble is divided into several services and each service is further divided into service components. A service component is either an audio channel or a data channel. The ensemble is decoded in a COFDM (Coded Orthogonal Frequency Division Multiplex) block 41 and subchannels SUBCH 1,...,SUBCHL are separated from the MSC channel in demuptiplexing. The desired subchannels are then led to be processed further. Multimedia services, a hypermedia service and a file-based service and a hypertext are formed by combining the service components of the subchannels, such as audio/speech, stream video and packet data in accordance with the application program. The formed services are then carried to the display device of the user or are processed further. Interface A is an interface of the service components after which the application programs form the desired services from the service components.

At the transmission end the service is divided into files. For example, in Figure 4 a hyper text document service 42 is divided into files. The mutual parallel and successive presentation of the files in time and spatial domain form a service ensemble. A parameter group called a message type is associated with each file. There are four message types: 1) file transfer description, 2) file content description, 3) file presentation description and 4) file execution description. The message types form a file of their own called a description file. It can be transmitted as a file description file or as data group fields by complying to a suitable specific format. In that case a description file is by definition a file that

contains the headers of all the files to be transferred via the channel. New data group types are formed for transferring it to the receiver, see Figure 3. Then the connection between the data groups and packets is known and it is as shown in Figures 2A and B.

In the receiver shown in Figure 4, not only the described service component channels but the information channel FIC and the information channel AIC (not shown in Figure 4) relating to audio and data services are derived from interface A which is a frame demultiplexed into subchannels. The data groups containing the message types of the service components are also received on this channel.

A service information handler block 51, an information channel handler block 52 and an application software block 53 are disclosed in Figure 5 as in prior art and their operation is known per se. Therefore the block 51 produces service information for the block 53 and the block 53 generates for the user e.g. a graphic user interface from which the user selects the desired service. After this, the application software block assigns to the information channel block 52 the task of separating the desired channels from the subchannels.

In accordance with the invention, the application software block 53 also separates the message types from the information produced by the block 51. In accordance with the file transfer description, the service components of a specified service in encoded form are filtered in a file transfer control block 57 as selected by the user, the files are formed and they are stored into a memory 58. The file encoded from the memory is lead to a file content decoding block 55 in which decoding is carried out in the way shown by the "file content description" message type. For example, a picture file is decoded

differently from a text file. Decoded files are further processed in a file execution block 56 or in a file presentation block 54.

If a file requires a specific execution, a moving image, for example, the application software block 53 will know from the "file execution description" message type it has received with which program the file will be started in the execution block 56.

If files relate to a multimedia or hypermedia application, the file presentation block 54 handles the linking, synchronizing and other conditions of the files so that the desired result will be reached. The application software block has obtained the necessary instructions from the "file presentation description" message type it has received.

In accordance with Figure 5, the desired service profile for the user is formed by searching for elements, classes and objects from the received channel, by identifying their groups and by searching for the attributes and connections of the groups. By means of the profile the service is formed from the information content of its components after unpacking their possible way of presentation (decoding, decompressing, etc.). The profile itself is a definition description that can be represented by a flow chart, a matrix, a navigation path or a tree. The profile is dependent on the properties of the receiver. For example, if the receiver cannot decode JPEG pictures, the pictures encoded with them can be omitted from the profile.

The service components are timed by aligning the time stamp of the component (beginning, end, duration) by comparing it with a reference time scale. The component presentation can be in a parallel or

series form.

Recommendation ETS 300075 can be utilized for forming file parameters but other parameter definitions and parameter values are also possible and do not restrict the method according to the present invention.

Table 1 shows some possible parameters of a file transfer description. In addition to these it may also contain other parameters that can be classified into the same category.

Table 2 shows some possible parameters of a file content description. This description may also contain other parameters that can be classified into the same category.

Table 3 hows some possible parameters of a file presentation description. The description may also contain other parameters that can be classified into the same category. This category especially comprises the location of the file in time and spatial domain for the presentation, the conditions triggering the file presentation, that is, dependencies on other presentations, the definitions of the resource channel and the links of the file to other files and media components.

Table 4 shows some possible parameters of a file execution description. The description may also contain other parameters that can be classified into the same category. This is true if the file itself is a file to be executed, but it is also true as an execution instruction for the executing program if the described file is the control file of the program to be executed.

As an example of the use of the invention the transmission of a newspaper should be mentioned. A page of the newspaper is divided into files in the desired manner. Each picture forms a file of its own and the

text ensembles or their parts files of their own. The page can also be gridded into blocks that form a file. By using the descriptions according to the invention the pages can be reproduced as complete at the reception end as each file is defined both with respect to its contents and with respect to other files both temporally and locally. In accordance with the profile the receiver creates, he/she can view only the pictures, specified texts, e.g. sports pages.

As the invention especially relates to the new digital audio system DAB, it may be assumed that the production numbers of the system and the equipment will be great. In connection with DAB, the data services and the mechanisms required by them are mostly unspecified. There is therefore a need for transmitting multimedia and hypermedia type of services to a mobile user. Different combinations of picture, voice and data services can be employed in numerous applications. Examples of these services could be a picture index of the yellow pages, petrol station catalogues, passenger information lists and hotel and restaurant directories. Other applications could be newspapers and comics, video announcements, advertisements and entertainment services.

It is to be understood that the specification above and the figures related thereto are only intended to illustrate the present invention. Different variations and modifications of the invention will be obvious to those skilled in the art without deviating from the scope and spirit of the invention disclosed in the appended claims.

Appendix:
1. Tables 1-4

Appendix 1.

Table 1.

Parameters of the File Contents Descriptor message

TRANSFER NAME:	file name during transfer
FILE SIZE:	Size of file in segments (Data Groups) Size of file in bytes
SEGMENT SIZE:	Segment size in bytes Segment size is variable
CLOSED USER GROUP ADDRESS:	End user address in Session header
CLOSED USER GROUP CHANGE:	Ensemble ID Service ID Subchannel ID Packet address End user address
TRANSFER CHANNEL:	Ensemble ID Service ID Subchannel ID Packet address End user address Name of the object library path in the object library file name item ID (SCINum)
TRANSFER TIMING:	transfer start time transfer duration transfer end time number of repetitions
THROUGHPUT CODE:	
PRIORITY:	
NUMBER OF REMAINING REPETITIONS:	

Table 2.

Parameters of the File Contents Descriptor message

FILE NAME:	
APPLICATION REFERENCE:	
FILE DATE:	Date and time yymmddhhmmss
FILE LENGTH:	File length in bytes (uncompressed format)
AUTHOR NAME:	
FILE VERSION NUMBER:	
FILE CREATION DATE:	Date and time yymmddhhmmss
FILE COST:	
FILE TYPE:	Description file Command file machine code format Text file ascii with character set tbd Data file binary data Picture file Picture in JPEG format Picture in TIFF format Software file source in ascii with character set tbd executable in format Hybrid file Item (SCINum)
PERMISSION MODE:	dont care / read / write / execute / replace / erase / reserved / insert/ extend / hide
COMPRESSION MODE:	
FILE CODING TYPE:	Basic ASN.1: ISO 8825 SGML ISO 9069 HTML other DTD other Markup Language Acrobat Postscrip
FILE CHECKSUM:	CRC with 32 bit polynom

Table 3.

Parameters of the File Presentation Descriptor message

PRESENTATION ATTRIBUTES:	
STARTING CONDITION:	List of triggering components
	Triggering conditions
TIME PRESENTATION OF FILE:	Time Origin
(HyTime format)	Date and time yymmddhhmmss
	Absolut time
	start (time from origin)/duration/end
	Relative time
	delay to start/duration/end
TIME PRESENTATION OF ITEM	Time Origin
(HyTime format)	Date and time yymmddhhmmss
	Absolut time
	start (time from origin)/duration/end
	Relative time
	delay to start/duration/end
SPATIAL PRESENTATION OF FILE:	Cartesian coordinates, Polar coordinates
SPATIAL PRESENTATION OF ITEM:	Cartesian coordinates, Polar coordinate
RESOURCE TYPE:	directory, file, item
RESOURCE LOCATION:	Ensemble ID, Service ID, Subchannel ID, Packet address,End user address, Name of the object library, path in the object library, file name, item ID (SCINum),
FILE LINKS:	File linking to other files
	File linking to other media components
OUTPUT DEVICE:	storage
	CD-ROM, hard disk, diskette,casette, memory,
	display
	type, character set, description language, font
	loudspeaker
	printer
	type, character set, description language, font

Table 4.

Parameters of the File Execution Descriptor message

EXECUTION ORDER:	priority
	repetition number
	determined order
	performance
LOAD ADDRESS:	
EXECUTE ABSOLUT ADDRESS:	
EXECUTE RELATIVE ADDRESS:	

Claims

1. A method for transferring a service comprising service components that contains audio and data information via a digital transmission link to a receiver, in which

audio and data information and service information are placed at the transmission end into several subchannels that are multiplexed into a transmission frame to be modulated and

the subchannels containing service components are separated at the reception end from a demodulated transmission frame and the desired service is formed by combining the desired service components,

c h a r a c t e r i z e d in that

at the transmission end the service is divided into files the mutual parallel and successive presentation of which in time and spatial domain forms a service ensemble, and a group of file descriptions describing this file is associated with each file,

at the reception end only the desired files are separated selectively from the files coming from the subchannels on the basis of their file descriptions which files will be further processed as determined by the file descriptions associated with them.

2. A method according to claim 1, c h a r a c t e r i z e d in that the first file description is a file transfer description comprising parameters which indicate at least the size information of the file, the individualizing information of the transmission channel and the timing information of the transmission.

3. A method according to claim 1, c h a r a c t e r i z e d in that the second file description is a file content description comprising parameters which indicate at least the type of the file and the format

of the file.

4. A method according to claim 3, c h a r a c t e r i z e d in that the file type is selected from the following group: a command file, a text file, a data file, a picture file, a program file, a hybrid file, a script file.

5. A method according to claim 1, c h a r a c t e r i z e d in that the third file description is a file presentation description comprising parameters which indicate for the presentation of the file at least the location of the file in time and spatial domain, the conditions triggering the presentation of the file and the links to other files and the description of possible printing devices.

6. A method according to claim 1, c h a r a c t e r i z e d in that the fourth file description is a file execution description comprising parameters which indicate at least an execution command and condition statements if the file is a file to be executed and an execution instruction if the file is the control file of the program to be executed.

7. A method according to claim 1, c h a r a c t e r i z e d in that the user forms a desired profile for the service in order to separate the files selectively.

8. A method according to claim 1, c h a r a c t e r i z e d in that a group of file descriptions describing the file is transmitted in several data packets which form the data field of the data group.

9. An equipment for transmitting a service comprising service components that contain audio and data information via a digital transmission link to a receiver, comprising:

means for placing audio and data information and service information into several subchannels and

for multiplexing them into a transmission frame,
c h a r a c t e r i z e d in that it further comprises:

first means for dividing the service into files the mutual parallel and successive presentation of which in time and spatial domain forms a service ensemble, and

second means for forming a group of file descriptions describing the file associated with each file,

third means for transmitting said group in a transmission frame.

10. An equipment for receiving a service comprising service components that contain audio and data information via a digital transmission link, comprising:

means for forming subchannels containing service components,

means for processing service information and for selecting the desired service,
c h a r a c t e r i z e d in that it further comprises:

separating means (51, 53) with which only the desired files are separated selectively from the files coming from the subchannels on the basis of their file descriptions,

further processing means (54, 55, 56) for processing further the files separated selectively as determined by the file descriptions associated with them.

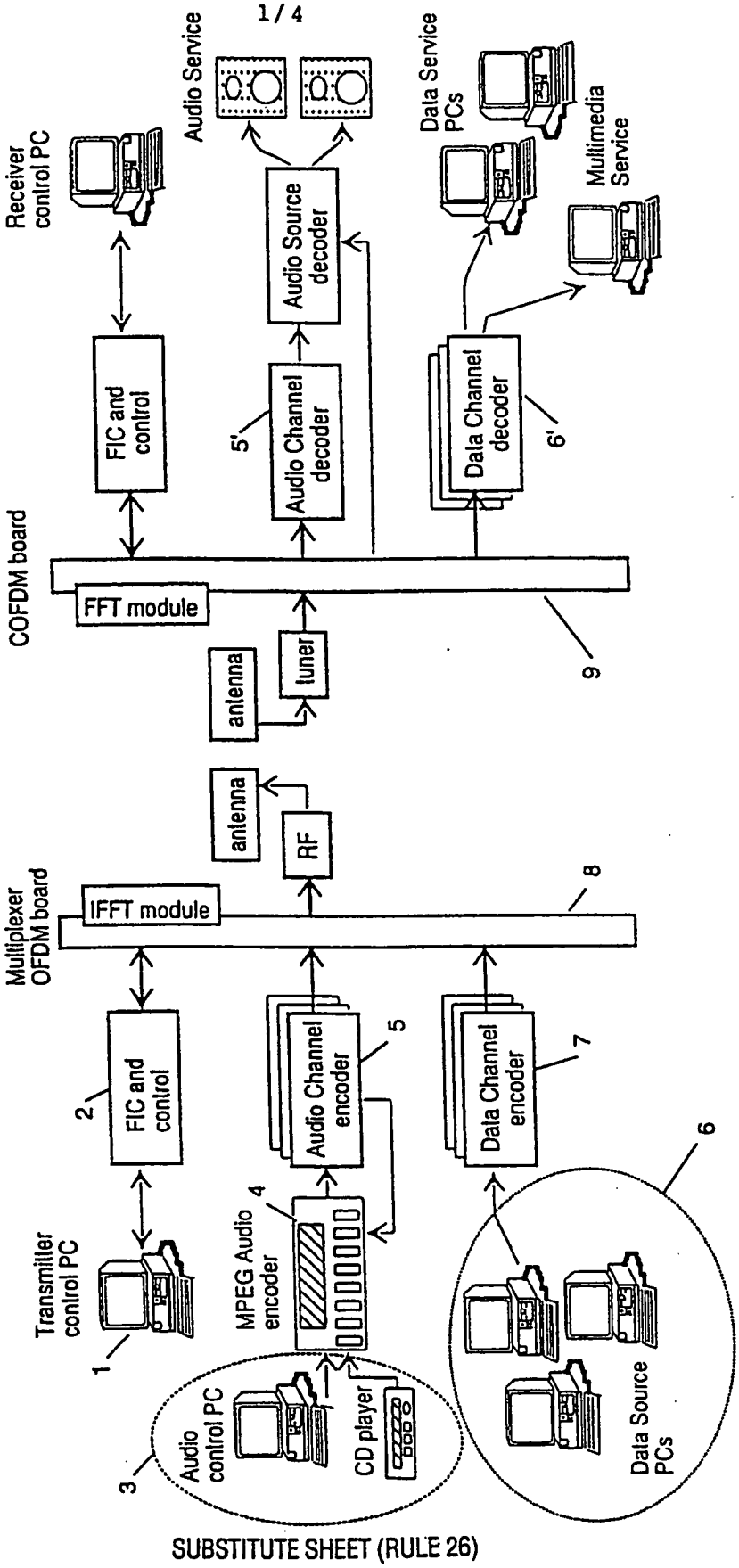
Audio Service
Data Service PCs
Multimedia Service
Receiver control PC
Audio Source decoder
FIC and control
Audio Channel decoder
Data Channel decoder
5'
6'
COFDM board
FFT module
antenna
tuner
9
antenna
RF
Multiplexer OFDM board
IFFT module
8
FIC and control
Audio Channel encoder
Data Channel encoder
2
5
7
Transmitter control PC
MPEG Audio encoder
4
6
1
Audio control PC
CD player
3
Data Source PCs

Fig. 1

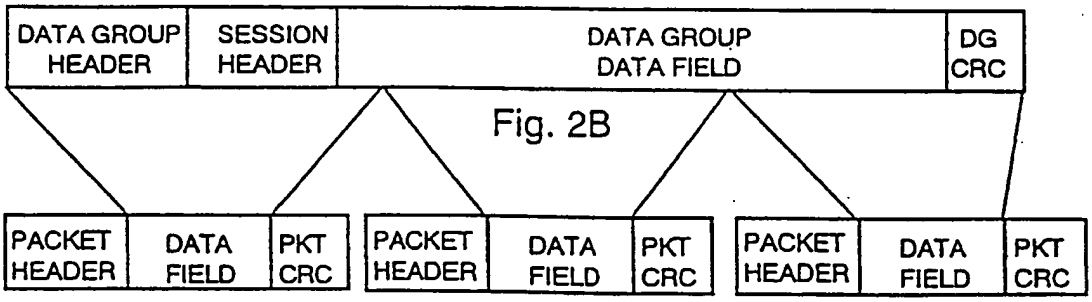

Fig. 2B

Fig. 2A

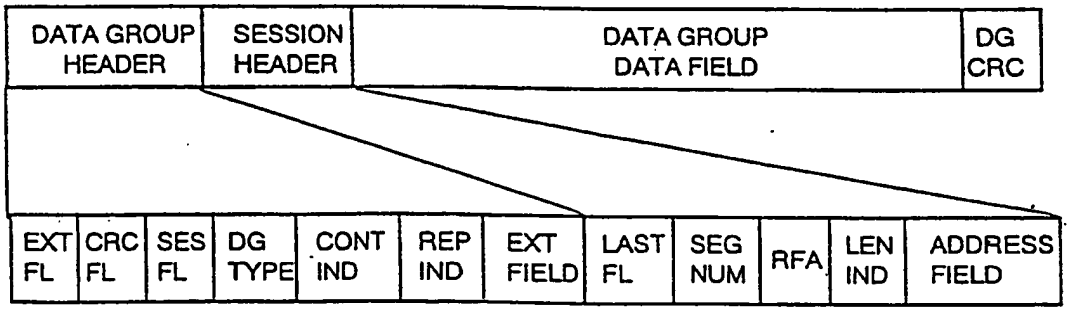

Fig. 3

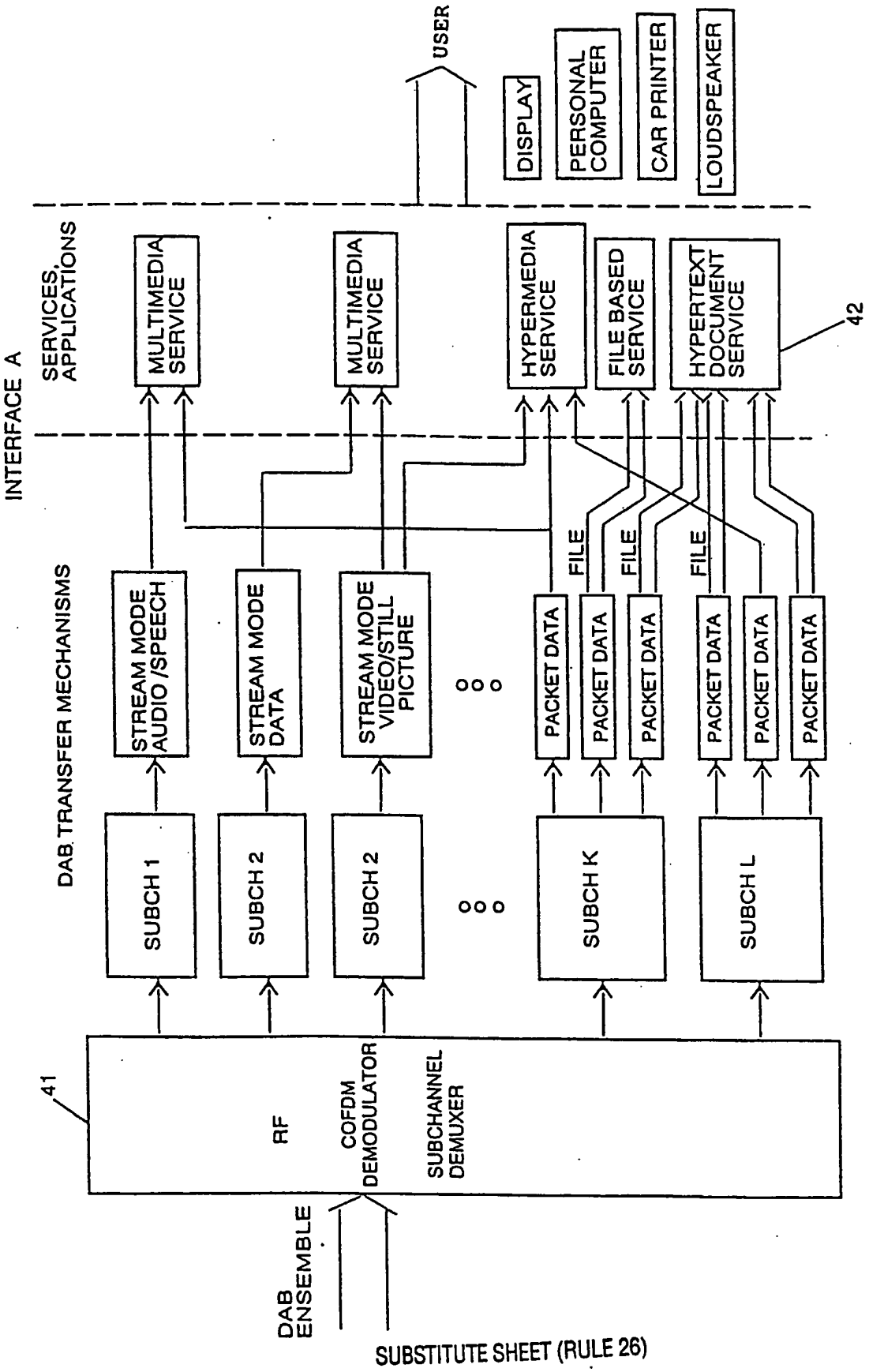
USER
DISPLAY
PERSONAL COMPUTER
CAR PRINTER
LOUDSPEAKER
INTERFACE A
SERVICES, APPLICATIONS
MULTIMEDIA SERVICE
MULTIMEDIA SERVICE
HYPERMEDIA SERVICE
FILE BASED SERVICE
HYPERTEXT DOCUMENT SERVICE
42
DAB TRANSFER MECHANISMS
STREAM MODE AUDIO /SPEECH
STREAM MODE DATA
STREAM MODE VIDEO/STILL PICTURE
FILE
FILE
FILE
PACKET DATA
PACKET DATA
PACKET DATA
PACKET DATA
PACKET DATA
PACKET DATA
SUBCH 1
SUBCH 2
SUBCH 2
SUBCH K
SUBCH L
41
RF
COFDM DEMODULATOR
SUBCHANNEL DEMUXER
DAB ENSEMBLE

Fig. 4

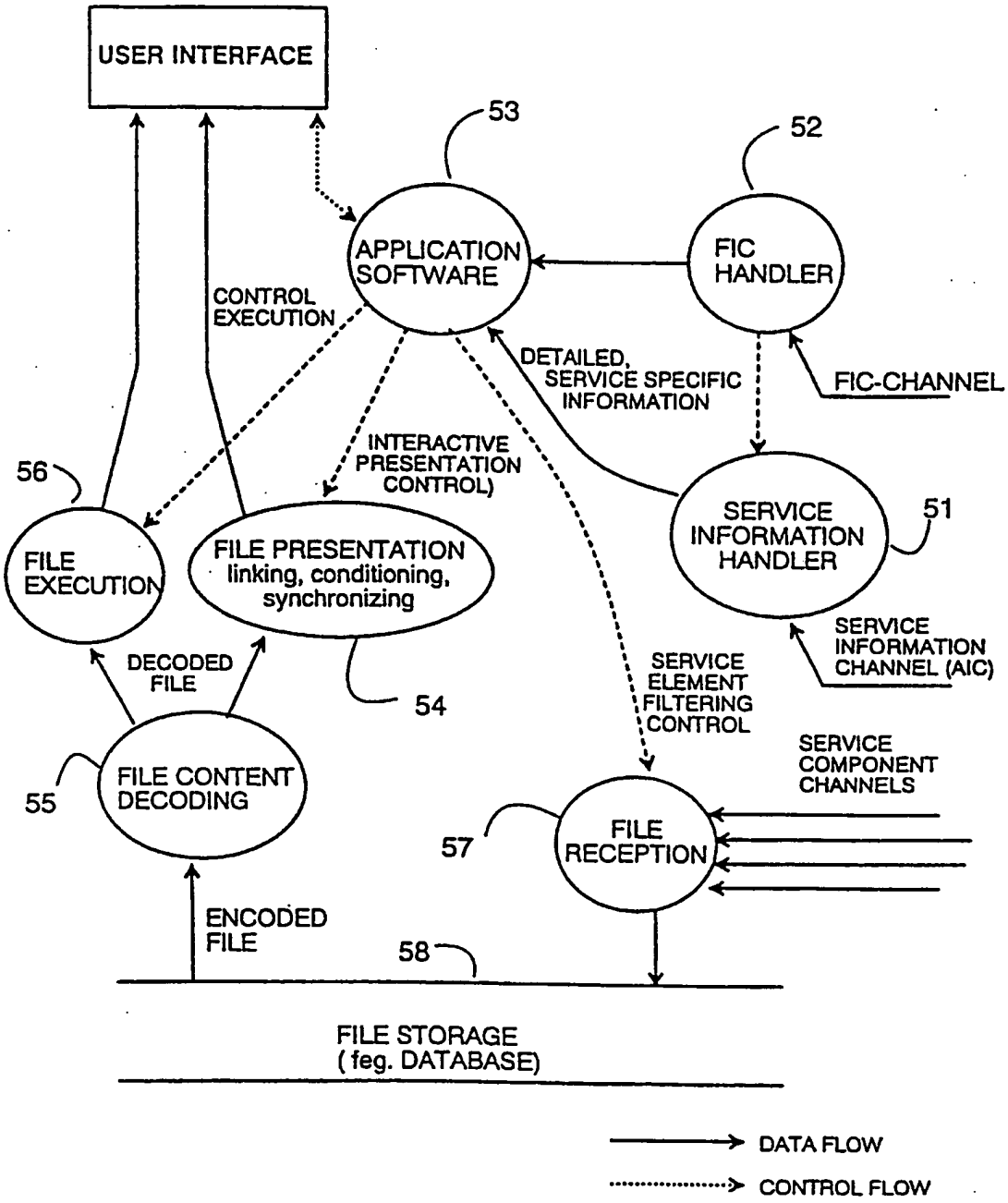
USER INTERFACE
53
52
APPLICATION SOFTWARE
FIC HANDLER
CONTROL EXECUTION
DETAILED, SERVICE SPECIFIC INFORMATION
FIC-CHANNEL
INTERACTIVE PRESENTATION CONTROL)
56
FILE EXECUTION
FILE PRESENTATION linking, conditioning, synchronizing
SERVICE INFORMATION HANDLER
51
SERVICE INFORMATION CHANNEL (AIC)
DECODED FILE
54
SERVICE ELEMENT FILTERING CONTROL
SERVICE COMPONENT CHANNELS
55
FILE CONTENT DECODING
57
FILE RECEPTION
ENCODED FILE
58
FILE STORAGE (feg. DATABASE)
DATA FLOW
CONTROL FLOW

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 96/00247

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04H 1/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5359601 A (ANTHONY J WASILEWSKI ET AL), 25 October 1994 (25.10.94), column 2, line 8 - column 3, line 42, abstract --	1,9,10
A	US 5400401 A (ANTHONY J. WASILEWSKI ET AL), 21 March 1995 (21.03.95), column 2, line 51 - column 3, line 54, abstract --	1,9,10
A	DE 4319217 C2 (ROHLING, HERMANN ET AL), 15 December 1994 (15.12.94), see whole docuent -- --------	1,9

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
7 October 1996	08 -10- 1996
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Peter Hedman Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

05/09/96

International application No.
PCT/FI 96/00247

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 5359601	25/10/94	AU-A- 6359994	26/09/94
		EP-A- 0688490	27/12/95
		JP-T- 8507666	13/08/96
		US-A- 5418782	23/05/95
		WO-A- 9421085	15/09/94
		AU-A- 5575894	24/05/94
		EP-A- 0682830	22/11/95
		JP-T- 8503823	23/04/96
		US-A- 5400401	21/03/95
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		JP-T- 8503823	23/04/96
		US-A- 5359601	25/10/94
		US-A- 5418782	23/05/95
		WO-A- 9410775	11/05/94
DE-C2- 4319217	15/12/94	NONE	